RESEARCH MACHINES

EPSON PRINTERS

Models MX80/100
TYPE III

380Z/480Z

USERS GUIDE

PN 11140

Epson Printers, Models MX80/100 Type III

380Z/480Z Users Guide, PN 11140

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PREFACE

This publication is a short introduction to the Epson MX-80/MX-100 Type III printers and explains how to connect these printers to Research Machines 380Z and 480Z microcomputer systems. It describes both the serial and parallel interfaces available for these printers and the associated interfaces available on the 380Z and 480Z systems. This publication is divided into two separate and independent manuals, one for the Research Machines 380Z and one for the Research Machines 480Z. These manuals complement the Epson Operation Manual and, where applicable, the RS-232C User manual which accompanies the printer.

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RESEARCH MACHINES

EPSON PRINTERS

Models MX80/ MX100

TYPE III

380Z USERS GUIDE

EPSON MX 80/MX-100 TYPE III PRINTER FOR THE RESEARCH MACHINES 380Z

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INTRODUCTION

The Epson printer manual(s) supplied with your printer will cover most of the day to day operation and maintenance of your printer. The purpose of this manual is to explain the different interfaces used on the Research Machines 380Z and Epson printers, and to explain the use of control codes which provide a number of special facilities with these printers.

HOW TO START WITH YOUR PRINTER

1. Follow the unpacking and setting up procedure described in your Epson operation manual.

2. Check the printer for any signs of damage that may have occurred during transit. If the printer does show signs of damage stop, and phone the Technical Support department on Oxford (0865)249866.

3. Determine whether your printer is parallel or serial. An explanation of these terms is given later.

4. Take the enclosed cable and plug into the correct interface on your Epson printer and Research Machines 380Z (descriptions of the various interfaces on both machines are described later in this document).

5. Read through this manual up to the end of the section "How to switch on and select the printer" and follow the instructions in that section.

Parallel or Serial?

Before data can be transferred from the 380Z to the printer there must be a connection between them; this is known as an interface. The interface should be compatible with other manufacture' s equipment i.e. defined. The interface dictates the type of plug used on the connecting cable, the way the plug is wired, the voltages of the signals used, and which wires go to which pins in that plug.

There are two distinct types of interface used in computers; they are:

parallel - where the seven or eight pulses (from the computer) are sent down separate strands of wire (in parallel: the user I/O port on the backpanel of the 380Z is a centronics compatible 7-bit parallel interface).

serial - where the pulses (from the computer) are sent down a single wire one after the other (serially).

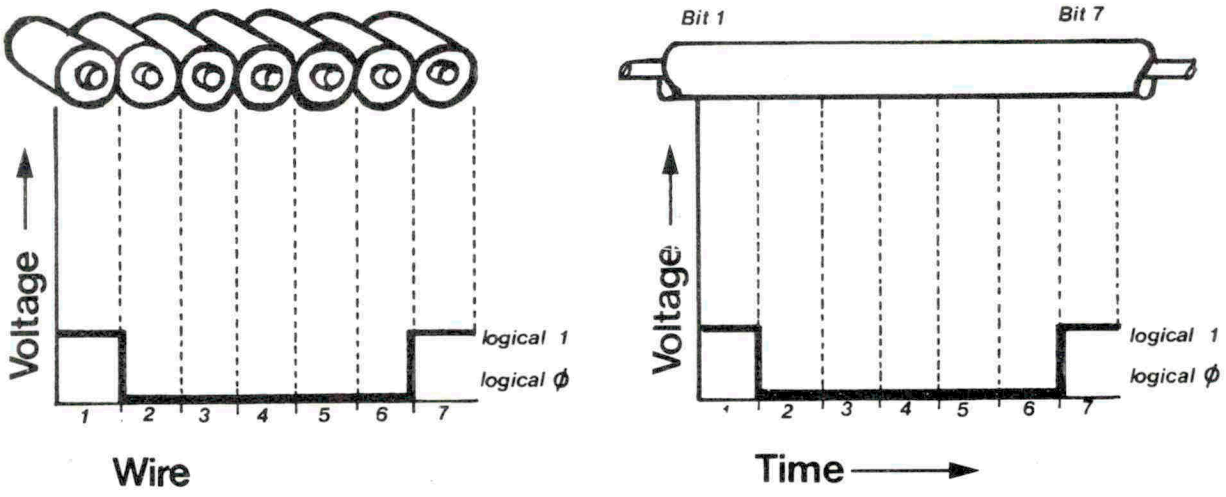


Diagram 1. Parallel and Serial data transfer

The relative positions of the interfaces on the backpanel of the two printers are shown in diagram 2 . Serial printers will be fitted with both interface sockets whereas parallel printers only have the parallel socket.

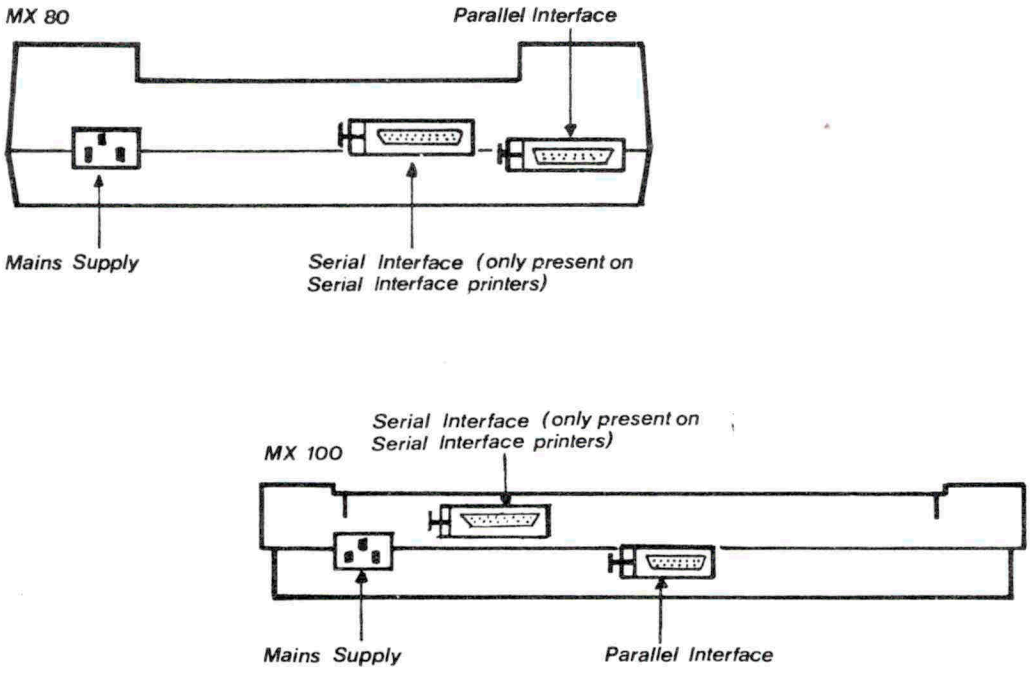
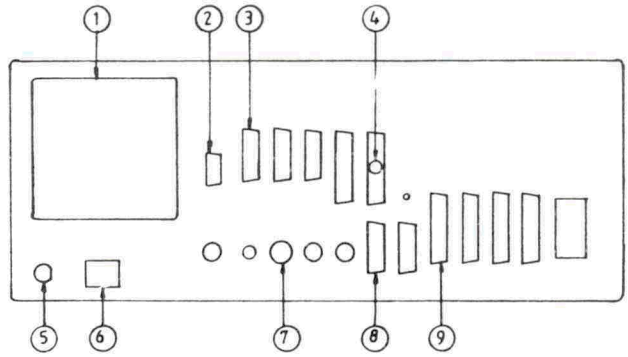


Diagram 2. MX-80, MX-100 Interface Arrangement

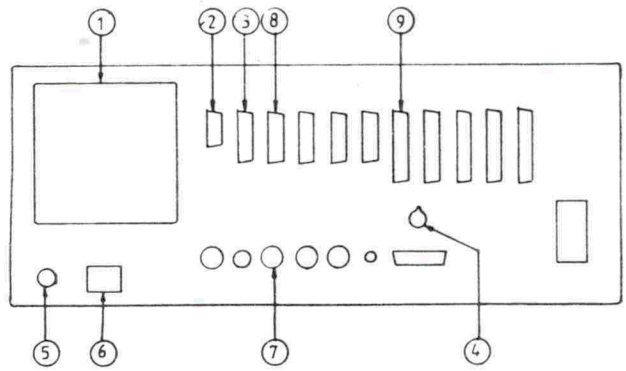
INTERFACES ON THE 380Z

The 380Z interface connectors are mounted on the backpanel of the processor box. Since a number of interface options are available on the 380Z, not all backpanels will look the same; however, the two most typical back panel configurations are shown in diagram 3.

Earlier Models



Later Models



KEY

1. Key
2. Keyboard
3. Parallel Interface (User I/O port)
4. Network
5. Fuse
6. Power Socket
7. Video Monitor
8. Serial Interface SIO-4 (printer)
9. Disc Drive

Diagram 3. Typical 380Z Backpanel Layouts

HOW TO CONNECT USING THE SERIAL INTERFACE

If you wish to connect your printer to the 380Z through the serial interface, refer to appendix A . This appendix describes the various types of serial interface facilities that can be found on 380Z systems; it then describes how to attach the printer to each of these.

HOW TO CONNECT USING THE PARALLEL INTERFACE

1. Find the 25-way 'D' type socket. The parallel port on the 380Z is a 25-way 'D' type socket which is marked 'USER I/O' (some older machines have this socket marked 'P1') as shown in diagram 3. If you are not sure which interface is the USER I/O port then read appendix C.

2. Plug the 'D' type plug into the User I/O port and the 36-way 'AMPHENOL' plug into the parallel interface socket on the printer.

HOW TO SWITCH ON AND SELECT THE PRINTER

1. Ensure the printer is ready for use (loaded with paper etc. See your printer manual).

2. Switch on at the mains using the switch at the side of the printer, the power light on the printer now comes on.

3. Switch on your computer and monitor. When the 'COS' prompt appears in the bottom left hand corner of the screen select your printer type (i.e. the computer needs to know which interface the printer is attached to). If you have a parallel printer, the following procedure should be carried out (if you have a serial printer, use the selection procedure described in appendix B).

4. A message similar to the following is displayed: **COS 3.4 E/M**

   Now enter: O
   The letter O is for Options

5. The screen displays: **Cassette or Lineprinter (C/L):**

   Now enter: L
   This is for the lineprinter option and the question displayed on the screen is not present on most machines.

6. The screen displays: **Printer type :**

   Now enter: 3
   This is for the Parallel Interface Option.

PRINTER ERROR MESSAGE (PARALLEL PRINTER ONLY)

If the following message appears on the screen: **Attend to Printer** the printer is not responding properly to the 380Z. To correct this error:

1. Ensure that:

   - all switches are ON
   - the paper-out light is OFF
   - the power light is ON.

2. Ensure the connecting cable is plugged securely into the correct socket. Now try selecting the printer again. If the 'Attend to Printer' message persists, then turn to appendix D.

HOW TO TEST THE PRINTER

To test that the printer is working:

1. Press: CTRL/T

2. Press any other key followed by RETURN. The keys you type should be printed immediately by the printer.

3. If no characters appear on the printer, ensure that the printer on-line light is on and try again. If you are still unable to get the printer to work turn to appendix D.

SOFTWARE CONTROL OF EPSON PRINTERS

HOW TO CONFIGURE THE CP/M OPERATING SYSTEM TO SELECT YOUR PRINTER

This section only applies to 380Z disc systems.

Each time the 380Z is reset or switched on, the printer option will need to be set up.

The easiest way of setting up the printer option is to use the 'O' command before loading the system (see above). It is possible to configure CP/M to set the printer option on automatically. The operating/loading program CONFIG, supplied on the CP/M system disc, provides the facility for configuring the system. The CONFIG program has been updated a number of times and the instructions to be used on earlier 380Z systems may differ slightly from those given below:

1. Insert a formatted disc into drive B.

2. Insert a CP/M disc into drive A.

3. Enter: B

4. A message similar to the following is displayed: **RESEARCH MACHINES**
   31K CP/M Vers 1.4B

   Enter: MOVCPM * * [RETURN]

5. A message similar to the following is displayed:

   CONSTRUCTING 56K CP/M VERS 1.4
   READY FOR "SYSGEN" OR
   "SAVE 32 CPM56.COM"

   Enter: SYSGEN [RETURN]

6. The screen displays: **SYSGEN VER 1.4**
   SOURCE DRIVE (OR RETURN TO SKIP)

   PRESS: [RETURN]

7. The screen displays: **DESTINATION DRIVE - (RETURN TO REBOOT)**

   Enter: B

8. The screen displays: **DESTINATION ON B THEN TYPE RETURN**

   Press: [RETURN]

9. The screen displays: **FUNCTION COMPLETE**
   DESTINATION DRIVE
   (RETURN TO REBOOT)

   Press: [RETURN]

10. The screen displays: **A>**

    Enter: **CONFIG** RETURN

    The screen displays: **Configure which disc (A,B):**

    Enter: B

11. The screen displays: **Insert disc in B then type RETURN:**

    Press: RETURN

12. The screen displays: **G(raphics,L(ineprinter,**
    X(ecute,Q(uit,R(estart,S(how,H(elp:

    Enter: L

13. The screen displays: **Leave unselected (Y/N):**

    Enter: N

14. The screen displays:**Printer type-**
    0 - Console screen
    1 - SIO-1
    2 - SIO-2
    3 - Parallel interface
    4 - SIO-4
    5 - SIO-5
    6 - SIO-6

    Enter: 3

    If you are using a serial interface version then select the appropriate interface number, for example SIO-4, then enter the corresponding baud code.

15. The screen displays: **G(raphics,L(ineprinter,**
    X(ecute,Q(uit,R(estart,S(how,H(elp:

    Enter: X

16. The screen displays: **Configuration complete**

The disc in drive B now contains a copy of CP/M that automatically selects the printer port when the system is loaded.

* CP/M is a registered trade mark of Digital Research

GENERAL SOFTWARE CONTROL OF YOUR PRINTER

The specification of your Epson printer includes a number of special features, including superscripts/subscripts, underlining, and boldface (emphasized). These are available under software control so that they can be used from within a program.

Note that the method used by the Epson printer to print subscript and superscript characters results in a downward 'creep' of the line being printed of 1/126" for each subscript or superscript character.

For futher information on the use of the above printing facilities simultaneously, please refer to your Epson manual.

THE ASCII CHARACTER SET

Computers represent text characters internally in numeric form, where each character has its own individual numeric value. To enable equipment from different manufacturers to exchange information, a standard has been created called the ASCII standard. The ASCII (American Standard Code for Information Interchange) standard defines which numeric values represent which characters; for example, the character A is represented by ASCII code 65 (base 10). To print a line of text, a series of coded numeric values is sent to the printer.

Certain of the ASCII codes are reserved for non-printable characters (control codes). These codes are numbered 0 - 31 (base 10) and in the case of the Epson printers can be used to control one of those special features such as underlining. A summary of control codes is given in your Epson operations manual (note that the codes 17 and 19 (base 10)) have been disabled on your printer).

Note: - Some of the features require more than one control code to be sent.

- Controlling the features of the printer involves sending the correct code to the printer at the right time (see below).

The following section describes both the control codes and the printer commands to be used with BASIC, TXED, and WordStar.

SOFTWARE CONTROL OF YOUR PRINTER FROM EXTENDED BASIC VERSION 5

The built-in commands for control of printers from Extended BASIC Version 5 are:

PRINTER - selects the printer option to be used e.g. PRINTER

LLIST - sends a listing to the currently-selected printer

LPRINT - the instruction is the same as PRINT except that the output goes to the printer rather than to the screen. For example:

```
LPRINT "Hullo World", A$
```

LTRACE - the instruction is the same as TRACE except that the output goes to the printer device.

LPOS - returns the printhead position on the currently accessed printer device (D is a dummy argument), for example:

```
LET P = LPOS(D)
```

LLVAR - lists values of simple variables on the printer.

HOW TO SEND CONTROL CODES FROM BASIC:

The printer responds to a number of control codes (see your Epson manual). BASIC uses two commands to send control codes; these are:

```
PUT #2,n
```

and

```
PRINT #2,CHR$(n);
```

Where 'n' is the ASCII code to be sent and '#2' is the printer channel number (the parameter which tells the computer to which device the code is to be sent).

Example 1.

When selecting the French character set, a three-character code needs to be sent (27,82,1). To select this, use one of the following statements:

```
PUT #2,27,82,1
```

or

```
PRINT #2,CHR$(27);CHR$(82);CHR$(1);
```

or

```
PUT #2,27,"R",1
```

where 'R' is the character represented by the code '82'.

Example 2.

When switching the printer into emphasised (bold-face) character mode, a two-character code needs to be sent (27,69). To switch to this mode, use one of the following statements:

```
PUT #2,27,69
```

or

```
PRINT #2,CHR$(27);CHR$(69);
```

or

```
PUT #2 27,"E"
```

Where 'E' is the character represented by the code 69.

SOFTWARE CONTROL OF YOUR PRINTER FROM TXED

TXED is currently supplied in two versions. One of these versions, TXEDE, contains a patch to allow you to use the superscript, subscript, underline, and bold-face (emphasized text) facilities of the EPSON printer. TXEDE is described in more detail in the TXED manual.

In TXEDE, bold face is implemented by overprinting the character three times, so a bold-face subscript or superscript will result in a creep of 3/126". It is recommended that bold-face and subscript or superscript not be used together.

TXED provides the following printing facilities:

P - Prints the contents of TXED buffer (see the TXED manual). This is not a formatting command and therefore is included in versions with or without the formatter.

QT - Outputs formatted text to the printer. Printing is continuous

QP - Outputs formatted text to the printer (like QT), but stopping at the bottom of each page. The next page is printed by pressing the RETURN key.

The following details relate only to the use of an earlier version of TXED that has not been patched. This information is not relevant to TXEDE.

Most of the Epson printer features can be controlled by sending to the printer a two-character code whose first character is ESC. For example:

ESC E - Switches the printer into bold-face (emphasized) printing mode

ESC F - Switches bold-face (emphasized) printing off.

As the character ESC cannot be transmitted through the keyboard, a character must be defined so that TXED can convert it to ESC.

To define a character as an ESC character, use the formatter command .E1c. Then on each occasion that the character represented by 'c' is encountered, an escape character will be sent. For example:

```
.E1%
```

defines the character '%' as the ESC character. The text string:

```
%E hullo world %F
```

would print 'hullo world' in emphasized characters on an Epson printer. For a list of the Epson type III control codes, refer to your Epson operations manual (appendix 5).

Sometimes non-printing characters other than ESC characters need to be sent to the printer to control the special features. This is done using the TXED command .CCc. The character given after .CC represents the control code sent. For example:

```
.CCA - ASCII code 1
.CCB - ASCII code 2
.CCZ - ASCII code 26
```

Note: When using the .CC command, a carriage return line feed is given after the control code has been sent; this will damage some sequences.

It is important to know the difference between the uses of the commands .CC and .E1. For example, the ASCII code 14 turns on enlarged character printing mode and can be sent from TXED with the line .CCN

SOFTWARE CONTROL OF YOUR PRINTER FROM WORDSTAR

WordStar Version 3.0 contains a patch file to allow use of an Epson type II printer with WordStar. The type II Epson provides a strict subset of the type III features. The procedure for patching WordStar is as below:

1. Make a copy of your WordStar disc

2. Copy the file DDT.COM from your system disc onto your WordStar disc using the PIP command.

3. Copy a CP/M system onto your WordStar disc using the SYSGEN command.

4. Reset the computer and place the WordStar disc into drive A.

5. Enter: B

6. The screen displays a message similar to: **RESEARCH MACHINES**
   47K CP/M VERS 1.4B

   Enter: DDT WS.COM

7. The screen displays: **NEXT PC**
   3F00 0100

   Enter: I EPSON.HEX

8. Enter: R

9. The screen displays: **NEXT PC**
   3F00 0100

   Enter: CTRL/C

10. The screen displays: **A>SAVE 62 WSE.COM**

The file WSE.COM is a WordStar file suitable for use with Epson type III printers.

GRAPHICS SUPPORT FOR THE EPSON SERIES OF PRINTERS

The Epson type III printers print high resolution graphics. The graphics facility requires software for the output of data. At the time of writing this software is only included in current releases of BASIC (versions 5.0L and later). If you do not have a suitable version, the current version may be ordered from Research Machines.

Extended BASIC Version 5.0L is supplied with three versions of the interpreter. Only the interpreter with the filename BASICSG2 contains the routine for printing graphics on the Epson printer. Some examples of BASICSG2 statements are given below.

CALL "PRINTER",1 - Selects suitable graphics output for the Epson MX series of printers.

CALL "DUMP",X1,Y1,X2,Y2 - Copies a rectangle of the screen onto the printer. This is specified by the bottom left corner (X1,Y1) and the top right corner (X2,Y2).

For futher information on the printing of high resolution graphics, refer to the appropriate BASIC programs, and the BASIC and High Resolution Graphics manuals.

Note: Low resolution graphics printing is not possible with this printer.

HOW TO SET THE PRINTER OPTION DIP SWITCHES

Inside the printer there are several banks of small switches; these control the printer options. These switches consist of one bank of eight and one bank of four on the main circuit board of the printer (serial interface versions have an extra set of switches on the serial interface board, these should not be touched, and the interface board will need to be removed prior to setting the main option switches). The switches on the main board are mainly used for setting up the default settings of various options, so that, for example, whenever you switch on, the printer will print using the default character set. As these characters are controlled within software, you will probably not need to alter the switch settings. If you do need to alter these settings, the procedure is:

1. Switch the printer off.

2. Follow the instructions in your printer operation manual and read the factory-set conditions for each switch setting.

RIBBONS AND PAPER FOR THE MX-80/MX-100 PRINTERS

The procedure for loading a new cartridge ribbon into the printer is covered in your Epson manual. We recommend you use only ribbons manufactured by Epson (see below for a list of ribbon suppliers).

The procedure for loading paper into the printer is covered in your Epson manuals. For a list of paper suppliers see below.

Action Computer Supplies,
6, Abercorn Trading Estate,
Manor Farm Road,
Wembly,
Middlesex.
Tel:01-903-3921 (Paper and ribbon suppliers)

Willis Computer Supplies,
P.O.Box 10,
Southmill Road,
Bishops Stortford,
Hertfordshire,
CM23 1BR.
Tel:(0279)506491 (Paper and ribbon suppliers)

Reedform Ltd.
Vale Road,
Windsor,
Berkshire.
SLA 5JL. (Paper suppliers only)
Tel:(075 35) 69691

Computer Services Scotland Ltd.
89/90 Westlaur Place,
Whitehill industrial estate,
Glenrothes,
Fyfe,
Scotland. (Paper and ribbon suppliers)
Tel:(0592) 773710

Note: This is not a recommendation of these firms.

APPENDIX A

LOCATING, IDENTIFYING AND USING THE DIFFERENT SERIAL INTERFACES OF THE 380Z

HOW TO LOCATE AND IDENTIFY DIFFERENT SERIAL INTERFACES ON THE 380Z

There are a number of different interfaces available for the 380Z. These are listed below:

TYPE	NAME	LINE PRINTER OPTION NUMBERS
Serial	SIO-1 (often found on cassette machines upgraded to disc, and early 380Zs usually with COS monitor,version 2.3 or lower).	1
Serial	SIO-2	2
Serial	SIO-2B (note the SIO-2B is not suitable use with Epson printers.)	2
Serial	SIO-4	4
Serial	SIO-4C	4
Serial	SIO-5	5
Serial	SIO-6	6
Parallel	User I/O Cable	3

Where B = 20mA current loop

Where C = Cassette

HOW TO ATTACH A SERIAL INTERFACE EPSON PRINTER TO YOUR 380Z

1. Establish which serial interface(s) your computer is fitted with. As a general guideline, the vast majority of disc based 380Zs are only fitted with an SIO-4 and a parallel interface. The backpanel of such machines will look like that shown in diagram 3. Instructions for finding each type of interface are given below in this appendix. Connect the printer to the 380Z serial interface connector; details for connecting each type of interface are given below in this appendix.

2. Switch on your 380Z.

3. To select the printer enter the option number of your serial interface into the computer e.g. to use a machine with an SIO-4 at 2400 baud:

At the prompt: **COS 3.4 E/M**
(this line differs according to version of firmware)

Enter: O
(the letter O for Options)

The screen displays: **Cassette or lineprinter (C/L):**

Enter: L
(this message/response is not required on most machines)

The screen displays: **Printer type :**

Enter: 4
(for lineprinter option 4)

The screen displays: **Baud Code :**

Enter: 4
(for 2400 baud)

HOW TO LOCATE AND IDENTIFY THE SIO-2

The SIO-2 interface is a small non-standard board and is about 4" x 3". It stands on three red pillars and has a multi-coloured cable leading from one end with a 25-way outlet socket on the 380Z rear panel.

To locate the SIO-2

1. Read the warning given below.

2. Remove the lid of the 380Z.

3. Check the multi-coloured cable to see if it needs rewiring. For rewiring instructions see appendix B.

Note: Only SIO-2 interfaces supplied before October 1980 are likely to need modifying

WARNING:

Do not mistake an SIO-2 for an SIO-2B (formerly the SIO-3). These two interfaces are almost identical in appearance. THE SIO-2B IS UNSUITABLE FOR USE WITH A EPSON MX-80/100 PRINTER.

The SIO-2B can be identified by the type of outlet socket on the 380Z rear panel. It has a round 6-way outlet socket, which cannot be used with the Epson MX-80/100 printer.

The SIO-2 has a 25-way outlet socket which is an elongated multi-pin socket.

HOW TO LOCATE AND IDENTIFY THE SIO-4

The SIO-4 is resident on the Floppy Disc Drive Controller board.

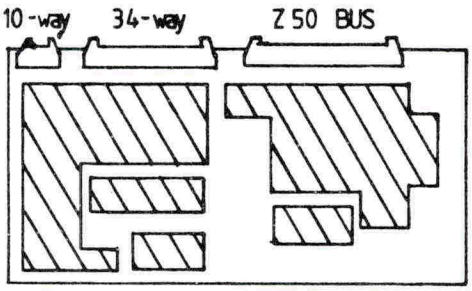


Diagram A.1 Floppy disc controller board.

The SIO-4/Floppy Disc Controller Board has a flat, 10-way, multi-coloured, cable leading from the top edge of the board to a 25-way outlet socket on the 380Z rear panel. On more recent 380Z systems it may be labelled 'S4' or 'SERIAL INTERFACE'. This cable may need rewiring. Only machines supplied before October 1980 are likely to need this modification. This should only be carried out by a technically competent person. See appendix B for a description of the correct wiring and instructions for the modifications.

Location on a Mini (5.25-inch) Disc-System

When facing your 380Z, from the front, the SIO-4 is usually the second board from the left-hand side of the machine (however it may be found in any of the board slots). It will have a 34-way flat grey cable going from its top edge to the disc drive units on its left.

Location on a full (8-inch) disc system

Facing your 380Z, from the front, the SIO-4 is usually the second board from the left hand side of the machine. It will have a 34-way flat grey cable going from its top edge to a rear panel 36-way socket, that is used to connect to the disc unit.

HOW TO LOCATE AND IDENTIFY THE SIO-4C
(Also refers to former SIO-1A Lineprinter Option 4)

The SIO-4C is a standard size 380Z board occupying one 380Z board slot. It is a standard serial interface for cassette-based 380Z systems and can be located in any of the 380Z board slots.

The SIO-4C has a 10-way multi-coloured flat cable going from its top edge to a 25-way outlet socket on the 380Z rear panel. On more recent 380Z systems, this socket may be labelled 'S1' or 'S4' or 'SERIAL INTERFACE'. The cable may need rewiring in machines that were supplied before October 1980. This should only be carried out by a technically competent person. Please see appendix B for a description of the correct wiring and instructions for the modification.

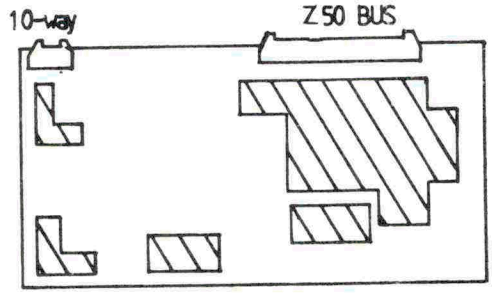


Diagram A.2 SIO-4C Board

HOW TO LOCATE AND IDENTIFY THE SIO-5 AND THE SIO-6

The SIO-5 and SIO-6 are additional high-speed serial interfaces. They are resident on standard-size 380Z boards and occupy one bus cable connection.

10-way Z50 BUS

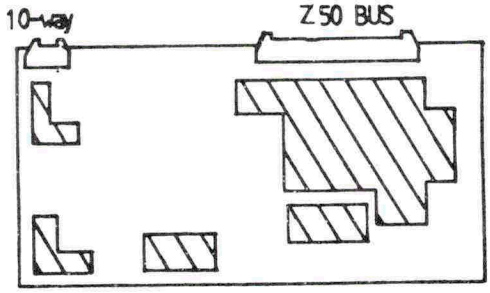


Diagram A.3 SIO5/6 Board.

These boards will be connected to the backpanel by a 10-way, multi-coloured, flat cable. In the majority of cases, no wiring changes are needed in order to use an SIO-5 or an SIO-6 with your Epson printer. If rewiring is necessary read appendix B for a description of the correct wiring and instructions for carrying out the modification.

APPENDIX B

MODIFICATIONS TO 380Z SERIAL INTERFACES

WHEN CONNECTING THE EPSON MX 80/100

HOW TO WIRE THE SIO-2 SERIAL INTERFACE CABLE CORRECTLY

All rewiring should be carried out by a technically competent person.

If your 380Z and/or your SIO-2 interface was supplied before October 1980, the interface may not be correctly wired for connection to an Epson MX-80/100 printer.

Ensure the cable connecting the interface board to the 25-way 380Z rear panel socket (which may be labelled 'S2'), is wired as shown below. If the cable has only three wires, an additional lead must be soldered onto Pin 4 (on the 25-way 380Z rear panel socket) on the tag marked IN1 (on SIO-2 interface board).

The correct cable wirings to run an Epson MX-80/100 printer on this interface are:

INTERFACE	FUNCTION	380Z 25-WAY SOCKET
TAG IN0	data to computer	Pin 2
TAG IN1	busy line	Pin 4
GROUND	signal ground	Pin 7
TAG OUT0	data from computer	Pin 3

If you are in any doubt about carrying out the rewiring then contact the Technical Support department at Research Machines.

HOW TO WIRE THE SIO-4C AND THE SIO-4 SERIAL INTERFACE CABLES CORRECTLY

(ALSO REFERS TO FORMER SIO-1A LINEPRINTER OPTION 4).

All rewiring should be carried out by a technically competent person.

If your 380Z and/or your interface was supplied before October 1980, the interface may not be correctly wired for connection to an Epson MX-80/100 printer.

The cable connecting the interface board to the 25-way 380Z rear panel socket (which may be labelled 'S1' or 'S4'), should be wired as below. In each case, there are ten wires to the cable, but only four are needed to run an Epson MX-80/100.

Note: - Pin 1 is the wire nearest the outer edge of the interface board.

- Wires not in use should be cut back and sleeved.

The correct cable wirings for this interface are:

INTERFACE	COLOUR	FUNCTION	380Z 25-WAY SOCKET
Pin 1	brown	data from computer	Pin 3
Pin 2	red	signal ground	Pin 7
Pin 3	orange	data to computer	Pin 2
Pin 5	green	busy line	Pin 4

On some 380Z systems, the busy line will not be wired to the 25-way 380Z but the rear panel socket will be wired to Pin 20. To run an Epson MX-80/100 printer, the busy line must be wired to Pin 4 on the rear panel socket.

From October 1980, all machines have the busy line wired to Pin 4.

If you are in any doubt about carrying out the rewiring then contact the Technical Support department at Research Machines.

APPENDIX C

HOW TO LOCATE AND IDENTIFY THE USER I/O CABLE (PARALLEL INTERFACE).

1. Remove the lid of the 380Z.

2. Find the CPU board. When viewing from the front of COS 3.0 and COS 3.4 machines, it is always located in the board slot furthest to the right hand side (COS 4.0 Varitext machines have the CPU board positioned one slot in from the right).

3. At the top edge of the board, you will find a 20-way edge connector. There may be a 20-way grey cable plugged in here, which leads to a 25-way outlet socket on the 380Z back panel. This is the User I/O cable.

If you do not have a User I/O cable

Some older machines were not fitted with User I/O cables. If this is the case with your system, please contact the Research Machines Sales department for details on the availability of this part.

APPENDIX D

WHAT TO DO IF YOUR PRINTER WILL NOT WORK

1. Ensure you have selected the correct printer option (and baud code if you are using a serial interface).

2. Ensure that the cable used to connect the printer to the computer is plugged into the correct interface on both pieces of equipment.

3. Disconnect the system from the mains supply and open the top of the computer.

4. Ensure all the connectors are pushed securely into their connecting sockets.

5. Ensure that the:

   - power light on the printer is ON.

   - paper release lever is in the forward, released position.

   - paper-out light on the printer is OFF.

   - on-line light on the printer is ON

   - ready light on the printer is ON.

GENERAL GUIDELINES FOR FAULTS THAT OCCUR ON ALL TYPES OF INTERFACES

There are five common faults that can occur:

FAULTS	REASONS
The printer is nothing and the 380Z appears to pause whilst outputting data and returns to either command level or the program.	The Epson may not be connected to the 380Z.
	The interface inside the 380Z is not installed correctly.
	The printer is plugged in and is accepting but not printing data.
The printer does nothing and the 380Z 'locks up' (sticks when trying to output the character).	The printer is plugged into the 380Z but not switched on.
	The wrong printer option has been selected.
	The printer or serial interface is faulty.
	The printer is out of paper.

FAULTS	REASONS
	The keyboard is locked out and the RESET switch on the 380Z needs to be pressed to escape and start again.
The printer successfully outputs character for a few lines then misses a number of characters, then recovers some of the output, then fails again.	Caused by the absence of a busy line. Check your interface against the correct wiring connections. See appendix B.
Characters that should appear on the printer appear instead on the screen, or characters appear 'doubled' on the screen.	Caused by failure to select the lineprinter option.
Rubbish characters are printed.	The printer and the computer may be at different baud rates.

IF YOU ARE STILL HAVING PROBLEMS

1. Ensure the paper is securely on the sprocket pins and the paper release lever has been returned to the forward, released position.

2. If something is still faulty and you have access to another machine, try the printer on this. If you think that an interface board in the 380Z is faulty, try one from another 380Z. If you have alternative sets of cables for the printer, try these also.

If you are unable to cure the fault then note down the details of the computer and printer, such as the type of interface being used, and contact the Technical Support department at Research Machines, Oxford (0865) 49866.

EPSON PRINTER SERVICING

The Research Machines appointed service organization is Kode Services Limited, based at Calne in Wiltshire (see below). This organization offers service contracts for Epson printers bought from Research Machines. If you do not take out a service contract for your printer, then Kode Services will still be able to service your printer, but the printer will have to be sent to their depot.

The warranty period for Epson printers is 90 days; if your printer fails during this period, the printer should be sent to Kode services where repairs will be carried out free of charge.

Note: The warranty for Epson printers does not include any carriage costs incurred.

Kode Services Limited : Calne (0249) 813771

APPENDIX E

SERIAL INTERFACE SWITCH SETTINGS

The serial interface has a number of options which may be set up from switches on the serial interface board. The setting of these switches will be correct on delivery but if they are changed at any time, the recommended settings are shown below:

Switch no.	Setting	Switch no	Setting
1.1	ON	2.1	OFF
1.2	ON	2.2	ON
1.3	OFF	2.3	OFF
1.4	OFF	2.4	ON
1.5	ON		
1.6	ON		
1.7	ON		
1.8	ON		

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S10-1A interface	B1
SIO-2 interface	A2,B1
SIO-4 interface	A3,B1
SIO-4C interface	A3,B1
SIO-5 interface	A4
SIO-6 interface	A4

RESEARCH MACHINES

EPSON PRINTERS

Models MX80/ MX100

TYPE III

480Z USERS GUIDE

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INTRODUCTION

The Epson printer manual(s) supplied with your printer will cover most of the day to day operation and maintenance of your printer. The purpose of this manual is to explain the different interfaces used on the Research Machines 480Z and Epson printers, and to explain the use of control codes which provide a number of special facilities with these printers.

HOW TO START WITH YOUR PRINTER

1. Follow the unpacking and setting up procedure described in your Epson operation manual.

2. Check the printer for any signs of damage that may have occurred during transit. If the printer does show signs of damage, stop and phone the Technical Support department on Oxford (0865)249866.

3. Determine whether your printer is parallel or serial. An explanation of these terms is given later.

4. Take the enclosed cable and plug into the correct interface on your Epson printer and Research Machines 480Z (descriptions of the various interfaces on both machines are described later in this document).

5. Read through this manual up to the end of the section "How to switch on and select the printer" and follow the instructions in that section.

Parallel or Serial?

Before data can be transferred from the 480Z to the printer there must be a connection between them; this is known as an interface. The interface should be compatible with other manufacture's equipment i.e. defined. The interface dictates the type of plug used on the connecting cable, the way the plug is wired, the voltages of the signals used, and which wires go to which pins in that plug.

There are two distinct types of interface used in computers; they are:

parallel - where the seven or eight pulses (from the computer) are sent down separate strands of wire (in parallel the user I/O port on the backpanel of the 480Z is a centronics-compatible 7-bit parallel interface).

serial - where the pulses (from the computer) are sent down a single wire one after the other (serially).

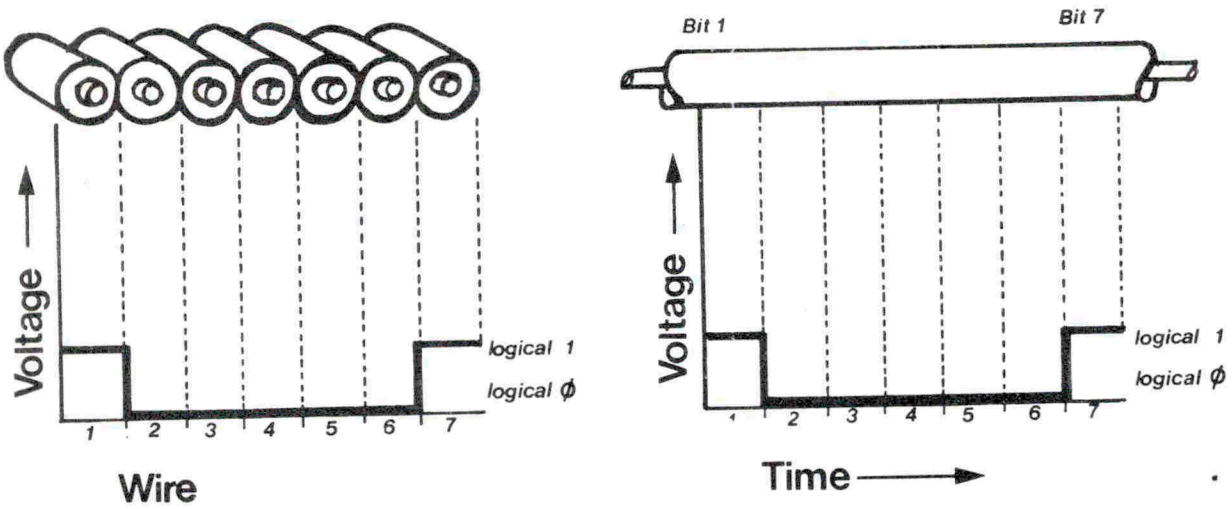

Diagram 1. Parallel and Serial data transfer

The relative positions of the interfaces on the backpanel of the two printers are shown in diagram 2. Serial printers will be fitted with both interface sockets whereas parallel printers only have the parallel socket.

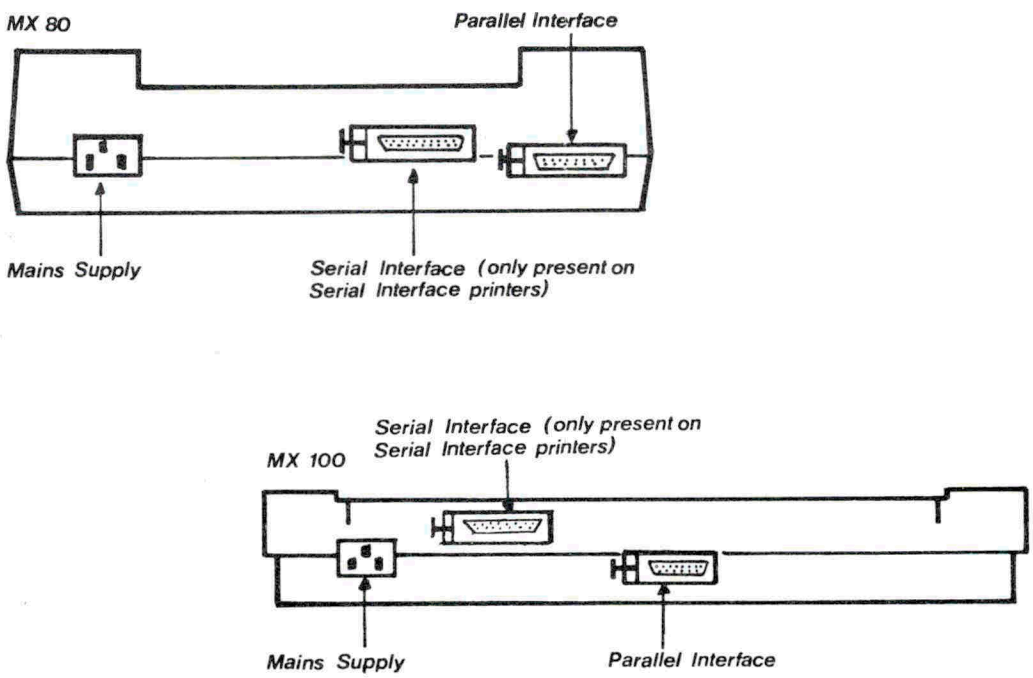

Diagram 2. MX-80, MX-100 Interface Arrangement

INTERFACES ON THE 480Z

The Interface connectors for 480Z interfaces are mounted on the backpanel of the computer. A typical 480Z back panel configuration is shown in diagram 3.

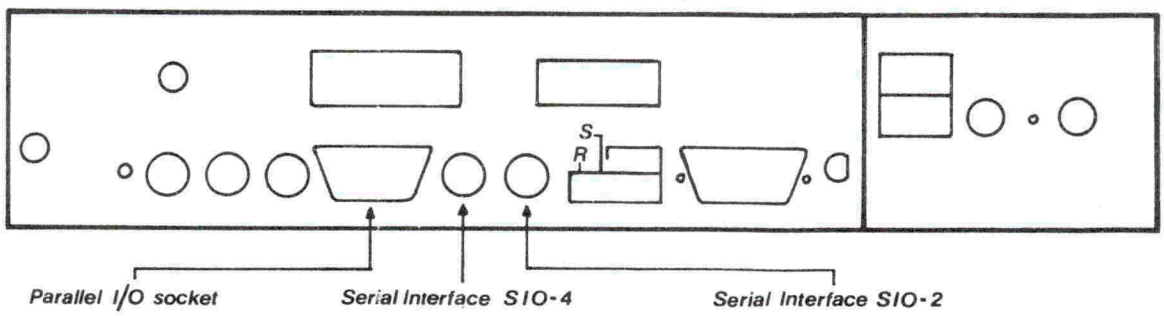

Diagram 3. Typical 480Z Backpanel Layout

HOW TO CONNECT USING THE PARALLEL INTERFACE

1. Find your 25-way 'D' type socket. The parallel port on the 480Z is a 25-way 'D' type socket which is marked 'PARALLEL I/O' as shown in diagram 3.

2. Plug the 25-way 'D' type plug, of the connecting cable, into the parallel I/O port and insert the 36-way 'AMPHENOL' plug into the parallel interface socket on the printer.

HOW TO CONNECT USING THE SERIAL INTERFACE

1. Find the connecting cable for the 480Z and the printer, the cable has a 25-way 'D' type plug on one end and a round 8 pin DIN plug on the other.

2. Plug the 8 pin DIN connector into the interface marked SIO-4 on the backpanel of the 480Z (see diagram 3) and plug the 25 way 'D' type connector into the more central of the two connectors on the back of the Epson printer (see diagram 2).

HOW TO SWITCH ON AND SELECT THE PRINTER

1. Ensure the printer is ready for use (loaded with paper etc see your printer manual).

2. Switch on the mains and the switch at the side of the printer, the power light on the printer now comes on.

3. Switch on the computer and monitor, and wait for the '}' prompt. The printer type must now be selected (i.e. the computer needs to know which interface the printer is attached to). See below for details of procedures to be carried out for parallel and serial interfaces.

HOW TO SELECT THE PRINTER OPTION FOR PARALLEL PRINTERS

1. At the '}' prompt (see above)

   Enter: O
   The letter O is for options.

2. The screen displays: **Cassette or Lineprinter (C/L):**

   Enter: L
   The letter L is for lineprinter.

3. The screen displays: **Printer type (0,2,3,4):**

   Enter: 3
   The number 3 is for parallel interface

If the message **'Attend to Printer'** appears on the screen at this point, the printer is not responding properly to the 480Z. To correct the error:

1. Ensure that:

   - all switches are ON

   - the paper-out light is OFF

   - the power light is ON.

2. Ensure the connecting cable is plugged securely into the correct socket then try selecting the printer again. If the 'Attend to Printer message persists then turn to appendix A.

HOW TO SELECT THE PRINTER OPTION FOR A SERIAL PRINTER

1. At the '}' prompt (see above)

   Enter: O

2. The screen displays: **Cassette or Lineprinter (C/L):**

   Enter: L

3. The screen displays: **Printer type (0,2,3,4):**

   Enter: 4

   For SIO-4

4. The screen displays: **Baud Code (0-6):**

   Enter: 4

   For 2400 baud

HOW TO TEST THE PRINTER

1. Press: CTRL/T

2. Press any other key followed by RETURN (no line feed will be given after pressing RETURN). This makes any key you type echo to the printer.

3. If no characters appear on the printer ensure that the printer on line light is on (if not push the on-line button and try again). If you still can't get the printer to work turn to appendix A.

Note: The printer may be selected at start up or from BASIC using the 'PRINTER' command.

Having established that the printer works the next few sections deal with the software control of the printer.

GENERAL SOFTWARE CONTROL OF YOUR PRINTER

The specification of your Epson printer includes a number of special features, including superscripts, subscripts, underlining, and bold face (emphasized). These are available under software control so that they can be used from within a program.

Note that the method used by the Epson printer to print subscript and superscript characters results in a downward 'creep' of the line being printed of 1/126" for each subscript or supersubscript character.

For further information on the use of the above facilities simultaneously, please refer to your Epson manual.

THE ASCII CHARACTER SET

Computers represent text characters internally in numeric form, where each character has its own individual numeric value. To enable equipment from different manufacturers to exchange information, a standard has been created, called the ASCII standard. The ASCII (American Standard Code for Information Interchange) standard defines which numeric values represent which characters; for example, the character A is represented by ASCII code 65 (base 10). To print a line of text, a series of coded numeric values is sent to the printer.

Certain of the ASCII codes are reserved for non-printable characters (control codes). These codes are numbered 0 - 31 (base 10) and in the case of the Epson printers can be used to control one of the special features such as underlining. A summary of control codes is given in your Epson operations manual (note that the codes 17 and 19 (base 10)) have been disabled on your printer).

Note: - Some of the controls require more than one code to be sent.

- Controlling the features of the printer involves sending the right code to the printer at the right time (see below).

The following section describes both the control codes and the printer commands to be used with BASIC, TXED, and WordStar.

SOFTWARE CONTROL OF YOUR PRINTER FROM EXTENDED BASIC VERSION 5

The built-in commands for control of printers from Extended BASIC Version 5 are:

PRINTER - selects the printer option to be used, e.g. PRINTER

LLIST - sends a listing to the currently-selected printer.

LPRINT - the instruction is the same as print except that the output goes to the printer rather than to the screen for example:

```
LPRINT "Hullo World", A$
```

LTRACE - the instruction is the same as TRACE except that # the output goes to the printer device.

LPOS - returns the printhead position on the currently-accessed printer device (D is a dummy argument), for example:

```
LET P = LPOS(D)
```

LLVAR - lists values of simple variables on the printer.

HOW TO SEND CONTROL CODES FROM BASIC:

The printer responds to a number of control codes (see your Epson manual). BASIC uses two commands to send control codes; these are:

```
PUT #2,n
```

and

```
PRINT #2,CHR$(n);
```

Where 'n' is the ASCII code to be sent and '#2' is the printer channel number (the parameter which tells the computer to which device the code is to be sent).

Example 1.

When selecting the French character, set a three-character code needs to be sent (27,82,1). To select this, use one of the following statements:

```
PUT #2,27,82,1
```

or

```
PRINT #2,CHRS$(27);CHRS$(82);CHRS$(1);
```

or

```
PUT #2,27,"R",1
```

where 'R' is the character represented by the code '82'.

Example 2.

When switching the printer into emphasised (bold-face) character mode a two character code needs to be sent (27,69). To switch to this mode, use one of the following statements:

```
PUT #2,27,69
```

or

```
PRINT #2,CHR$(27);CHR$(69)
```

or

```
 PUT #2 27,"E"
```

Where 'E' is the character represented by the code 69.

SOFTWARE CONTROL OF YOUR PRINTER FROM TXED

TXED is currently supplied in two versions. One of these versions, TXEDE, contains a patch to allow you to use the superscript, subscript, underline, and bold face (emphasized text) facilities of the EPSON printer. TXEDE is described in more detail in the TXED manual.

In TXEDE, bold face is implemented by overprinting the character three times, so a bold face subscript or superscript will result in a creep of 3/126". It is recommended that bold face and subscript or superscript not be used together.

TXED provides the following printing facilities:

P - Prints the contents of TXED buffer (see the TXED manual). This is not a formatting command and therefore is included in versions with or without the formatter.

QT - Outputs formatted text to the printer. This is a formatter command and is intended for use with a Qume sprint 5 printer; certain formatter features such as underlining and bold face characters will not work with the Epson series of printers.

QP - Outputs formatted text to the printer (like QT), but stopping at the bottom of each page. The next page is printed by pressing the RETURN key.

The following details relate only to the use of an earlier version of TXED that has not been patched.

Most of the Epson printer features can be controlled by sending to the printer a two-character code whose first character is ESC, for example:

ESC E - Switches the printer into **emphasized** printing mode i.e.bold face print.

ESC F - Switches **emphasized** printing off.

As the character ESC cannot be transmitted through the keyboard, a character must be defined so that TXED can convert it to ESC. To define a character as an ESC character, use the formatter command .E1c. Then on each occasion that the character represented by 'c' is encountered, an escape character will be sent. For example:

```
.E1%
```

defines the character '%' as the ESC character. The text string:

```
%E hullo world %F
```

would print 'hullo world' in emphasized characters on an Epson printer. For a list of the Epson type III control codes , refer to your Epson operations manual (appendix 5).

Sometimes non-printing characters other than ESC characters need to be sent to the printer to control the special features. This is done using the TXED command .CCc. The character given after .CC represents the control code sent, for example:

.CCA - ASCII code 1
.CCB - ASCII code 2
.CCZ - ASCII code 26

Note: When using the .CC command a carriage return - line feed is given after the control code has been sent; this will damage some sequences.

It is important to know the difference between the commands .CC and .E1. For example the ASCII code 14 turns on enlarged character printing mode and can be sent from TXED with the line .CCN

GRAPHICS SUPPORT FOR THE EPSON SERIES OF PRINTERS

The Epson type III printers print high resolution graphics. The graphics facility requires software for the output of data. At the time of writing this software is only included in current releases of BASIC (versions 5.2H and later). If you do not have a suitable version, the correct version, may be ordered from Research Machines.

Extended BASIC Version 5.2H and later versions are supplied with three versions of the interpreter. Only the interpreter with the filename BASICSG2 contains the routine for printing graphics on the Epson printer. Some examples of BASICSG2 statements are given below:

CALL "PRINTER",1 - Selects suitable graphics output for the Epson NX series of printers.

CALL "DUMP",X1,Y1,X2,Y2 - Copies a rectangle of the screen onto the printer. This is specified by the bottom left corner (X1,Y1) and the top right corner (X2,Y2).

For futher information on the printing of high resolution graphics, refer to the appropiate BASIC programs, and the BASIC and High Resolution Graphics manuals.

Note: Low resolution graphics printing is not possible with this printer.

HOW TO SET THE PRINTER OPTION DIP SWITCHES

Inside the printer there are several banks of small switches; these control the printer options. These switches consist of one bank of eight and one bank of four on the main circuit board of the printer (serial interface versions have an extra set of switches on the serial interface board; these should not be touched, and, the interface board will need to be removed prior to setting the main option switches). The switches on the main board are mainly used for setting up the default settings of various options so that, for example, whenever you switch on, the printer will print using the default character set. As these characters are controlled within software, you will probably not need to alter the switch settings. If you do need to alter these settings, the procedure is:

software, you will probably not need to alter the switch settings. If you do need to alter these settings, the procedure is:

1. Switch the printer off.

2. Follow the instructions in your printer operation manual and read the factory-set conditions for each switch setting.

RIBBONS AND PAPER FOR THE MX-80/MX-100 PRINTERS

The procedure for loading a new cartridge ribbon into the printer is covered in your Epson manuals. We recommend you use only ribbons manufactured by Epson (see below for a list of ribbon suppliers).

The procedure for loading paper into the printer is covered in your Epson manuals. For a list of paper suppliers see below.

Action Computer Supplies,
6, Abercorn Trading Estate,
Manor Farm Road,
Wembly,
Middlesex. (Paper and ribbon suppliers)

Tel:01-903-3921

Willis Computer Supplies,
P.O.Box 10,
Southmill Road,
Bishops Stortford,
Hertfordshire,
CM23 1BR. (Paper and ribbon suppliers)

Tel:(0279)506491

Reedform Ltd.
Vale Road,
Windsor,
Berkshire.
SLA 5JL. (Paper suppliers only)

Tel:(075 35) 69691

Computer Services Scotland Ltd.
89/90 Westlaur Place,
Whitehill industrial estate,
Glenrothes,
Fyfe,
Scotland. (Paper and ribbon suppliers)

Tel:(0592) 773710

Note: This is not a recommendation of these firms.

APPENDIX A

WHAT TO DO IF YOUR PRINTER WILL NOT WORK

1. Ensure you have selected the correct printer option (and baud code if you are using a serial interface).

2. Ensure the cable that is used to connect the printer to the computer is plugged into the correct interface on both pieces of equipement.

3. Disconnect the system from the mains supply and open the top of the computer. Ensure all the connectors are pushed securely into their connectors

4. Ensure that the:

   - power light on the printer is ON.
   - paper release lever is in the forward, released position.
   - paper out light on the printer is OFF.
   - on-line light on the printer is ON.
   - ready light on the printer is ON.

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There are five common faults that can occur:

FAULTS	REASONS
The printer does nothing and the 480Z appears to pause whilst outputting data and returns to either command level or the program.	The Epson may not be connected to the 480Z. The interface inside the 480Z is not installed correctly. The printer is plugged in and is accepting but not printing data.
The printer does nothing and the 480Z 'locks up' (sticks when trying to output the character).	The printer is plugged into the 480Z but not switched on. The wrong printer option has been selected. The printer or serial interface is faulty. The printer is out of paper. They keyboard is locked out and the RESET switch on the 480Z needs to be pressed to escape and start again.

The printer successfully outputs characters for a few lines then misses a number of characters, then recovers some of the output then fails again.	Caused by the absence of a busy line. Check your interface against the correct wiring connections. See appendix B.
Characters that should appear on the printer appear instead on the screen, or characters appear 'doubled' on the screen.	Caused by failure to select the lineprinter option.
Rubbish characters are printed.	The printer and the computer may be at different baud rates.

IF YOU ARE STILL HAVING PROBLEMS

1. Ensure the paper is securely on the sprocket pins and the paper release lever has been returned to the forward, released position.

2. If something is still faulty and you have access to another machine, try the printer on this. If you think that an interface board in the 480Z is faulty, try one from another 480Z. If you have alternative sets of cables for the printer, try these also.

If you are unable to cure the fault then note down the details of the computer and printer, such as the type of interface being used, and contact the Technical Support department at Research Machines on Oxford (0865) 49866.

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Kode Services Limited : Calne (0249) 813771

APPENDIX B

SERIAL INTERFACE SWITCH SETTINGS

The serial interface has a number of options which may be set up from switches on the serial interface board. The setting of these switches will be correct on delivery but if they are changed at any time,the recommended settings are shown below:-

Switch no.	Setting	Switch No.	Setting
1.1	ON	2.1	OFF
1.2	ON	2.2	ON
1.3	OFF	2.3	OFF
1.4	OFF	2.4	ON
1.5	ON		
1.6	ON		
1.7	ON		
1.8	ON		

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RESEARCH MACHINES

MICROCOMPUTER SYSTEMS